Method for Controlling Pick-Up Head During A Long Seek

DESCRIPTION

Background of Invention

[Para 1] 1. Field of the Invention

[Para 2] The present invention relates to a method for controlling an optical disk drive, and more particularly, to a method for controlling a pick-up head during a long seek.

[Para 3] 2. Description of the Prior Art

[Para 4] An optical disk is a type of rapid random access storage media. For this purpose, an optical disk drive must use a seeking servo to control a sledge to the target track at high speed, and then use a tracking servo to track on (or lock) the target track and follow the target track to reproduce the information recorded on the target track.

[Para 5] For example, please refer to Fig. 1 illustrating the track-on action of a prior art pick-up head 24. Generally, when an optical disk drive is performing a long seek, a seeking servo controls a sledge 26 to move to the target track 23 and then a tracking servo control the pick-up head 24 to execute the track on action. Also, the sledge 26 provides a movable range 27 as a fine tuning range for the pick-up head 24 to execute the track on action, following action or short seek. When the pick-up head 24 is not controlled, the elastic device 25 moves the pick-up head to the center of its movable range. When the sledge 26 is driven to the target track 23, as shown in Fig. 1, the tracking servo controls the pick-up head 24 to track on (or lock) the target track 23 of the disk 22.

[Para 6] Please refer to Fig. 2 illustrating the feed motor output (FMO) signal vs. time as the optical disk drive is performing a long seek according to the prior art. An optical disk drive sends an FMO signal to the sledge motor to drive the sledge. To increase the access speed of the optical disk drive, the sledge is driven by a larger force during the beginning of the long seek, and as the sledge approaches the target track, the force becomes smaller to lower the speed of the sledge. As shown in Fig. 2, for example, from time t0 to time t1 when the sledge starts a long seek, the sledge motor, controlled by the FMO signal, applies a larger force on the sledge to make it move rapidly; however, when the sledge is approaching the target place at time t1, the force is lowered under the control of the FMO signal to slow down the sledge so that the pick-up head can successfully execute the track on action.

[Para 7] Generally, because of the larger force applied to the sledge during the beginning of the long seek, the sledge moves so rapidly that the pick-up head moves unstably (back and forth) within its movable range because it is attached to an elastic device 25. Therefore, because the pick-up head is unstable, the track-on action often fails when the sledge arrives at the target track.

[Para 8] To make the track-on action succeed, in the prior art, the pick-up head provides a central error output (CEO) to make sure the position of the pick-up head in the movable range. The CEO is the signal indicating the position at which the pick-up head is located. The CEO is at the zero-crossing point when the pick-up head is at the center of its movable range. Therefore, the actual position of the pick-up head can be detected by checking the CEO.

[Para 9] In the prior art, the control chip of the optical disk drive provides a controlling signal according to the CEO for closed-loop control of the pick-up head. The pick-up head is held at the center of its movable range during a long seek by the control of the controlling signal. However, to reduce the cost

of the pick-up head, the CEO is omitted in some specific pick-up heads. When the sledge 26 accelerates towards direction A, as shown in Fig. 3, the pick-up head 24 deviates from the center of its movable range in the direction opposite to the direction A and oscillates due to its inertia. However, when the CEO is omitted, the control chip in the optical disk drive cannot support the closed-loop control, so the pick-up head 24 oscillates in its movable range during a long seek, leading to the failure of the track-on action frequently.

Summary of Invention

[Para 10] One objective of the claimed invention is to provide a method for controlling a pick-up head of an optical disk drive with no center servo control during long seek to prevent the pick-up head from oscillating, thereby solving the above-mentioned problem.

[Para 11] According to one preferred embodiment of the present invention, a method for controlling a pick-up head during a long seek is disclosed. The method includes identifying an accelerating direction of a sledge; and applying a force on the pick-up head when the sledge is accelerating, wherein the force is in the same direction as the accelerating direction.

[Para 12] According to a second preferred embodiment of the present invention, a method for controlling a pick-up head during a long seeking is also disclosed for used in the pick-up head without a central error output. The method includes driving a sledge by using a Feed Motor Output (FMO) signal; and providing a controlling signal to a pick-up head when the sledge accelerates, wherein the controlling signal drives the pick-up head to accelerate in the same direction as that of the sledge.

[Para 13] It is one advantage of the present invention that a controlling signal is provided to trigger a bias voltage against the inertia of the pick-up head to

prevent the pick-up head from oscillating when a long seek is activated, and therefore, the probability of a successful track-on action is increased.

[Para 14] These and other objectives of the present invention will no doubt become obvious to those of ordinary skill in the art after reading the following detailed description of the preferred embodiment that is illustrated in the various figures and drawings.

Brief Description of Drawings

[Para 15] Fig. 1 is a diagram illustrating a track-on action of a prior art pick-up head.

[Para 16] Fig. 2 is a diagram illustrating a feed motor output (FMO) signal vs. time during a long seek of an optical disk drive according to the prior art.

[Para 17] Fig. 3 is a diagram illustrating the prior art pick-up head lagging behind a sledge due to an inertia of the pick-up head when the sledge is accelerated by a sledge motor.

[Para 18] Fig. 4 is a flowchart of a method for controlling a pick-up head during a long seek according to the present invention.

Detailed Description

[Para 19] To avoid the oscillation of the pick-up head within its movable range and the resulting failure of the track-on action during a long seek, the invention provides a method for controlling the pick-up head during a long seek. The present invention is applied to a pick-up head without a CEO.

[Para 20] When the sledge is driven during a long seek, the control chip in the optical disk drive must identify the direction in which the sledge accelerates. Then, a bias voltage triggered by the control signal generated by the

controlling chip is used to balance the inertia of the pick-up head so that the pick-up head stops oscillating. So, when the sledge motor applies a force to the sledge, the controlling signal forces the pick-up head to accelerate with the same acceleration as the sledge; therefore, the oscillation of the pick-up head can be greatly reduced.

[Para 21] Figure 4 illustrates the method of the present invention for controlling the pick-up head during a long seek. It includes the following two steps:

[Para 22] S1: Identifying the direction the sledge accelerates during a long seek according to the FMO signal; and

[Para 23] S2: Using the FMO signal to drive the sledge and using the controlling signal to drive the pick-up head.

[Para 24] According to an embodiment of the present invention, because the weights of the sledge and the pick-up head are different, the ratio of the FMO signal to the controlling signal must be determined according to their weights. As a result, the sledge and the pick-up head will have the same acceleration so that the pick-up head stops oscillating.

[Para 25] In the prior art, due to its inertia, the pick-up head moves in the direction opposite to the direction of the sledge. Therefore, the present invention provides a controlling signal to generate a bias voltage against the inertia, so that during a long seek, the pick-up head can be held at a specific position within its movable range, stopping the oscillation of the pick-up head. Consequently, after a long seek, because the pick-up head is stable, the track-on action can then be done more reliably.

[Para 26] The advantage of the present invention is to provide controlling methods for a long seek. During a long seek, a controlling signal is provided to trigger a bias voltage against the inertia of the pick-up head to prevent the pick-up head from oscillating, and therefore, the probability of a successful track-on action is increased.

[Para 27] Those skilled in the art will readily observe that numerous modifications and alterations of the device and method may be made while retaining the teachings of the invention. Accordingly, the above disclosure should be construed as limited only by the metes and bounds of the appended claims.